CENTRAL INTELLIGENCE AGEN

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COUNTRY USSR

REPORT

SUBJECT 1. Design and Production Progress of Internal-Combustion Engines
2. Railroad Locomotives Using Internal-Combustion Engines

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THIS IS UNEVALUATED INFORMATION.

1. Two reports dealing with Soviet internal-combustion engines

2. Attachment a contains data on the design and production progress of internal-combustion engines in the USSR and includes an appendix on Soviet diesel engines.

3. Attachment b contains data on railroad locomotives using internal-combustion engines.

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Attachment A 50X1-HUM

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Economic/Scientific

I.C. Engines: Design and Production Progress in U.S.S.R.

The trend of internal combustion engine design in U.S.S.R. is at present controlled by their need for larger units in traction and ship-propulsion, and lighter units for oil-drilling, pumping and compressor plants and transportable emergency power units for small townships and airfields.

2. The characteristics of those engines which were in quantity production in 1961, are shown in the table at Appendix A.

3. (a) [redacted] the chief defects encountered 50X1-HUM in engines of Russian manufacture are:

Warping of welded crank-cases
Top-ring groove wear
Excessive lubricating-oil consumption
Sensitivity of engine to sulphur content of fuel oil.

(b) It is rare for Russian-built I.C. engines to go for more than five 50X1-HUM thousand hours between major overhauls (for engines in the range of hundreds to thousands of H.P.). The endurance of the best [redacted] engines working for fifteen to twenty thousand hours between major overhauls was several times questioned by Russian engineers.

4. Some minor points of design noted [redacted] were: 50X1-HUM

a) the use of aluminium-tin thin shell bearings seems to be normal practice, and

b) the smaller engines have mainly toroidal combustion-chambers with flat bottom to the cavity.

5. Turbo-blowers:

(a) The following were the principal types in 1961:

T K P 5, 8, 11, 14, 18, 23: all inward radial- flow turbines.
T K P 30: fir-tree root turbine blades.

(b) All had...

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(b) All had plain bearings.

(c) The largest size with inward radial-flow turbine appeared larger than anything currently available 50X1-HUM

6. Air-Cooled Engines

(a) The Russian type D.50, producing 50 to 54 H.P. at 2100 r.p.m. was the largest air-cooled engine in "series" production, and these were not being made in large quantities in 1961.

(b) The D.30 with 95 mm. bore and 120 mm. stroke gives 30 H.P. at 1450 r.p.m. with a fuel consumption of 190 grams/H.P./hour: this engine was in bulk production in 1961.

7. Engines of 100 to 500 H.P.

there was last year (1961) a serious shortage of I.C. engines in the range of 100 to 500 H.P. at 1000 to 1500 r.p.m. 50X1-HUM

8. Transportable generator sets for lighting small townships in emergency, of 1000 kW output and designed to be carried on the railway or on road trailer vehicles, are envisaged by GOSPLAN.

9. Portable Generators for Airfields

The Russians use, as standard, a 300 kW, 208 volt, 3 ph. 400 c/s set for airfield use.

10. Marine Propulsion

(a) In ship propulsion, heavy slow-speed engines had hitherto been most suited to Russian design 50X1-HUM

There is now a demand for diesel-electric propulsion in the 3000 to 4000 H.P. range, and for this, lighter, higher-speed engines will be needed.

(b) Tankers: The 60,000 ton tankers which were being built at LENINGRAD will be followed by a 100,000 ton tanker (in 1961 still on the drawing-board). The larger tankers of 50 to 60 thousand tons were being built at the ADMIRAL'SKIJ and BALTISK yards in less than 16 months from keel-laying to completion. Large quantities (numbers unspecified.....

unspecified) of smaller tankers were being built at the KHERSON yard on the Lower DNEPR and at the end of 1961, the first gas-turbine driven tanker of 1700 tons displacement was built at LENINGRAD.

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(c) Whale factory Ships of 45,000 tons displacement were fitted with two 7500 H.P. main engines running at 150 r.p.m., and two 450 H.P. auxiliary sets.

(d) Hydrofoil Vessels: Particulars of three sea-going and river passenger vessels were given as follows:

	Power	Passenger load.	Speed	Endurance
"METEOR"	two 850 H.P.	150	33 kn.	600 km.
"REKETA"	single 900 H.P. (1650 r.p.m.)	65	33 kn.	-
"KOMETA"	two 250 H.P.	50	up to 25 kn.	-

In connection with these and similar high-speed craft, the Russians have sought a 1500 H.P. engine of 1500 r.p.m., driving through an 8 : 1 reduction gear.

APPENDIX A

RUSSIAN DIESEL ENGINES noted in MOSCOW, 1961.

No. of Cyl.	Bore (mm)	Stroke (mm)	r.p.m.	B.H.P.	E.M.Ep. (p/s.i.)	Remarks
V16	230	300	750	3000	260	Rail traction - this engine appeared to be the largest standard.
10	230	300	750	2000	-	Rail traction
6	180	220	750	150	77	Marine
6	360	450	375	900	113	"
V12	180	200	1500	1000	143	Automotive purposes - twin o.h. camshaft: very small and light.
Flat 6	130	140	2100	180-270	150	Automotive traction and general purposes
V6	130	140	2100	180-270	150	The V6 and V8 will be
V8	130	140	2100	240-360	150	standard engines in the
V12	130	140	2100	400-600	167	1960/65 5-year plan
V12	150	180	1500	300 N.A. 500 p.c.	67 113	Very compact & mass-produced model for automotive and general purposes.
Inline 6	150	180	1500	250 p.c.	113	Marine
4	120	140	1500-2000	50-75	68	General purposes standard
6	120	140	1500-2000	90-120	80.6	engines for 1960/65
8	120	140	1500-2000	160-300	109-153	5-year plan.
1	-	-	up to 2100	8	-	Very compact, general purposes air-cooled engines designed for mass-production.
3	-	-	1450	up to 30		
4	-	-	up to 2100	" "40-50	-	The 4-cyl. air-cooled engine was not in bulk production in 1961.

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Attachment B

Economic/Scientific

U.S.S.R. Railway Locomotives using I.C. Engines.

Russian railway locomotives have in the past been provided with heavy, slow-speed engines now proving too heavy and bulky for future developments.

2. The engine of Russian design and manufacture at present installed in the standard "Co-Co" type railway locomotive, is a 10-cylinder, 2-stroke diesel giving 2000 B.H.P. at 750 r.p.m. A lighter high-speed substitute of 2400 H.P. output with diesel-hydraulic transmission, is being considered for the longer runs now being included in the next 5-year plan.

3. The existing Class T.E. diesel-electric locomotive is to be superseded by a new design using a 1500 r.p.m. engine giving about 2000 H.P.

4. A diesel-electric locomotive used on lines with steep gradients had, in 1961, a Russian-built V16, 3000 H.P. engine running at 750 r.p.m.; the locomotive type designation is unknown.

5. A lighter engine is used in the Class M.G. diesel hydraulic-locomotives: the Russian 2000 H.P. V12 is fitted as standard, but some of these locomotives have an 8-cylinder JENBACH-type JW as alternative to the Russian engine.

6. It was stated by the Russians in September 1961 that they had a 4000 H.P. diesel-electric locomotive in general use, and also a 6000 H.P. tandem-diesel built at the MALYSHEV factory at KHARKOV. The type references of these locomotives are uncertain, but the 6000 H.P. is believed to be the UKRAINA TE 12, with gas turbo-blowers. It is alleged to haul a full load at 100 k.p.h., using 60 tons of fuel for the journey from KHARKOV to VLADIVOSTOK.

7. The Russian rail-car has standard power units of 240 H.P., 1800 r.p.m. "under-floor, water-cooled, flat type diesel engine." Russian production capacity in 1961 was inadequate to supply fully the need for this engine. Serious trouble has been encountered by freezing of the water in the cooler system and, accordingly the Russians are seeking an air-cooled engine in replacement.

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